



# What is a Blockchain?

## Why it's Perfect for Healthcare Applications

**Blockchain is a much talked about technology and is now relatively well established in the financial sector as a secure form of payments transfer – and the basis of all cryptocurrencies, which has also driven consumer adoption. But what is often less well reported is its significant potential as a transformative technology in a multitude of healthcare settings. Its immutability makes it not only suitable for traceable financial and token-based transactions, but also as an ideal tracking and security platform for both patient records and the pharmaceutical supply chains amongst a multitude of emerging applications.**

**In this article we will discuss what blockchains are, the different types and why they have so much potential in healthcare settings as the technology matures.**

### What is Blockchain?

In simple terms, a blockchain is a shared digital ledger of transactions across disparate businesses without the need for control by any single central entity – meaning its free from any centralised control. The ledger works by grouping information into chronologically-ordered blocks or nodes (bits of information) and these are then linked and secured using the latest cryptography technology. What adds further security is that the database is distributed across a network of multiple computers, which reduces the risk of security breaches as there is no single point of failure. These platforms also safeguard data against losses by being frequently verified and distributed and any individual changes will be tracked in the blockchain itself. This means that the entire digital record is visible to everyone who is authorised, including all the changes over its lifespan and can even include who made any changes – the latter being incredibly important reason for its suitability as a supply chain record (i.e. its always clear who did what and when)

More recently, “Smart Contracts” have been much discussed, which enables two or more parties to sign an immutable contract that is automatically fulfilled (i.e. triggering payments or the release of certain predefined information). The smart contract details the asset exchange terms and allows for total transparency and, in the case of the healthcare sector, as one example, could provide chain of custody of records.

### Public and Private Blockchains

The most obvious question when looking at utilising a blockchain is to determine whether they are going to be implemented as public or private blockchain platforms. In the pharma industry, unlike say the cryptocurrency space (where full visibility is vital), companies lean towards using private blockchains due to the increased security that is offered. These permissioned blockchains require authentication such

as invitations and in some circumstances “legal” contracts to join, whereas public blockchains are open for anyone to join and see. The activities and membership within public platforms are regulated under a governance model, which can be encoded into the blockchain protocol. Public platforms are the original concept for blockchains that distributed ledger purists believe should be used as they allow greater data sharing, but for the sake of security, private blockchains are more widely used within the pharmaceutical industry.

A more recent development we have seen and one that is particularly important in healthcare settings is the in ‘interoperability’ between chains, which empowers the sharing of data amongst disparate systems. This means that old concerns about everyone having to be on the same blockchain platform are no longer a concern. Data can be transferred between different blockchain platforms.

One area in healthcare that is maturing at the similar moment at blockchain technology are advanced therapies. And here, in these complex supply chains, where security of patient data, and tracking of chain of identity is quite literally a life and death matter, blockchains can help ease the burden and reduce complexity. The ability to securely track a sample from the patient to the pharma company where the therapy is made and back again to the individual patient is huge leap forward in an area where paper-based administration still leads. In fact, earlier this year ATMPs Ltd received the patent in the USA for the utilisation of blockchain technology in the tracking from vein to vein of advanced therapies products. This is potentially a revolutionary step for advanced therapies and will help remove many of the logistical burdens faced in their scale up and distribution, especially as many more enter the market over the next few years.

One further application we are particularly excited about is helping simplify the relationships between payors, hospitals and developers of treatments. One of the ongoing challenges here is managing all the multiple partners in terms outcomes for the patient. So even in the simplest approaches there is still a great deal of paperwork needed from the hospital to the payor (insurer in the USA or the NHS in the UK) and to the developer of the therapy but then equally between the developer and the payor. The net result is a large expensive and administrative burden on the healthcare system.

However, we can simplify these reimbursement models using smart contracts on blockchain. So for example, in the United States, blockchain could be used to enable the administering hospital to trigger the payments automatically once certain conditions (clinical outcomes) for payment have been met. This therefore means the developer will receive payments faster. But it also provides advantages for both the hospital and payor in reducing the burden of cross-checking medical records, and what a specific plan covers or not in terms



of treatment, while also greatly increasing transparency – as their will be a single record of the therapy from ordering and tracking to outcome. And of course, from the patient perspective the chain means they will be able to more accurately plan for when to attend the hospital – as they can be automatically notified and the hospital can better predict treatment plans.

But what of the bigger picture ideas that could emerge in the medium to longer term. Blockchain is widely seen as one of the founding infrastructures that will be required to build web 3.0. And, while there are many immediate term benefits, as per Amara's law the longer term is likely to see completely different healthcare architecture.

For example, Smart cities using the IoT (the internet of things) – which connects technologies allowing the exchange of data across devices and systems using the Internet and other various communication networks – will be able to be automated and potentially linked directly into the healthcare apparatus. Blockchain and especially cross chains will grow in importance as the transition to these processes and machine-to-machine communication becomes more prevalent. These transactions between machines will therefore not need human intervention which allows for faster transferring of patient information and greatly benefits the healthcare sector for both professionals and patients.

Another area we believe blockchain will have an impact is in the growing use of AI in pharmaceutical discovery, genetic analysis and wider healthcare sectors – as it can ensure non corruption of data, particularly as they transfer between systems.

### Conclusion

As companies see the decrease in time and money spent on developing advanced therapies and starting clinical trials when blockchain is introduced and as regulators start mandating more full transparency from end-to-end, we will see blockchain become a norm within pharma. This adoption will be revolutionary for patients, speeding up the process to get them new medicines and technologies as regulatory approval is expedited and tracking patients progress within new data hubs. Records for devices and patients will be able to be linked for doctors and innovators in ways that were previously unimaginable in a globally centralised structure.

With the current maturity of blockchains, the ability to make processes and workflows more efficient and the cost reductions that are provided, if you are implementing new systems, the most important question to ask is why blockchain tools?



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